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ABSTRACT

This guide describes a model to help students understand environmental and conservation concepts. The guide proposes four concepts: (1) The Wholeness of Earth's Systems; (2) The Effects of Ecosystems on Human Beings; (3) Human Beings are Now the Most Influential of Earth's Organisms; and (4) Our Ability to Comprehend Must be Coupled With the Obligation of Self-Control. There are four segments, each of which contains a three-grade portion of the K-12 span. Each segment treats the four concepts and offers considerations and approaches for introducing students to the concepts. (RE)

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CONCEPTS

Preface

The *Colorado Model for Conservation Education* is an instructional tool consisting of two volumes. The first volume, identified on the cover by the word "Concepts," has within it the conceptual framework. A teacher can use this volume to plan instruction, and identify strengths and needs. The word "Resources" is applied to the second volume. It contains selected materials, strategies and activities keyed to the first volume — "Concepts." It is intended that these volumes can be applied in all curriculum areas. These are, however, merely suggestions for teaching particular topics and are presented to stimulate the teacher's imagination.

The Model was created to be used by teachers after successful completion of inservice sponsored by the Colorado Department of Education.

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To The Colorado Model for Conservation Education

The more Colorado grows, the more imperative conservation becomes. In achieving it, our schools play an ever-increasing role. Attainment of the life quality we desire for ourselves, for future generations, and for all living things that share the world with us, demands a high degree of student knowledge, attitudes, and behavior in the use of natural resources.

Most of us recognize that we must now abandon the reckless squandering of those resources that once seemed limitless. We recognize that they are finite, calling for our careful stewardship. We need to live in harmony with nature rather than to try to conquer it.

The Colorado Model for Conservation Education is a teaching tool. The State offers it, neither as a mandate nor a new course of study, but simply to suggest to school districts the blending of conservation principles into existing instructional programs.

People have the power to determine their destiny. The responsibility to maintain clean water, purify the air, protect our soils, and manage our energy will devolve upon this generation now in school. Their understandings through you of how these four elements interact with each other and with life will equip them to discharge their stewardship competently and beneficially.

Nutritional vitality is directly related to agricultural productivity which, in turn, is determined by our land-use decisions. Other land-use decisions govern the fate of the magnificent wildlife that is a Colorado treasure. Many species are either endangered or they flourish, survive or become extinct, as a result of our actions. Their health also reflects positively on environmental quality, serving as a barometer to signal trouble or well-being for humans.

A desire to live in harmony with natural systems and the skills to follow such a way of life are the ultimate goals of conservation education. If students leave school with an appreciation of these aims, all of us who are responsible for Colorado's educational system will have achieved one of the State's major objectives.

Richard D. Lamm
Governor

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Suggestions for Using the Model

The purpose of this model is to help students in all grades respect and conserve natural resources for themselves, for future generations, and for all life. This stewardship demands knowledge and wisdom. Its attainment presents a multidisciplinary challenge to the schools.

How can students learn to use our diminishing mineral and energy resources prudently without spoiling our air and water nor sacrificing our soils and wildlife? The model is first of all an instrument for measuring the success of present teaching programs in answering that question. The model then suggests how any needs may be met.

This is not a new course. Rather it offers teaching concepts that can bring conservation principles into every subject in the curriculum.

Flexibility is built in. The suggestions fit easily into current classroom procedures and are designed to be amplified or modified in accordance with the user's own perception of students' needs and abilities. Teaching aids and strategies are selected with a view to making both teaching and learning a pleasure.

The Model Applied

The model is divided into four major parts according to grade level — K-3, 4-6, 7-9, and 10-12. Each part is constructed around four basic concepts. These range through the entire spectrum of learning that sound conservation demands. The concepts are:

1

The Wholeness of Earth's Systems

The biosphere is a function of Earth's place in the solar system. Recognizing this fact is fundamental to understanding conservation principles and the completely inter-related life-support systems within the Earth's environments.

2

The Effects of Ecosystems on Human Beings

Natural forces and resources set the limits within which we develop our society. They provide us with the opportunities for creating the life styles we desire.

3

Human Beings are now the Most Influential of Earth's Organisms

Technology has enabled us alone among all living creatures to control some life-support systems and to modify our environment significantly. The consequences to ourselves and to the plant and animal kingdoms often are serious.

4

Our Ability to Comprehend Must be Coupled with the Obligation of Self-Control

Every individual has a responsibility to use natural resources wisely. Such stewardship is in the interest of self, of other people, and of all the forms of life that share our planet. Each of us has opportunities to meet that responsibility every day.

The Foldout Panels

The four concepts are printed prominently on the foldout panels that precede the text for each grade level. The panels also contain the major learning objectives pertinent to the grades covered. These are divided, as is the entire model, among five elements of an equation which expresses the model's underlying philosophy:

WATER + AIR + SOIL + ENERGY = LIFE.

These foldouts can be removed as posters or for other instructional purposes.

Identifying Strengths and Needs

The model is in two parts. The first is titled "Strengths and Needs." It briefly states what students should learn during each stage of their schooling if they are to understand the needs and methods of conservation.

The following rating scale is a handy measure of the degree to which students have learned and are working with each of the statements, focal points or quality indicators. The number, one to five, may be placed in the margin below the number of the statement. A glance at the page will then show the extent to which these quality indicators of conservation education are being achieved.

1. Uninstructed or Uninformed
2. Beginning to Learn
3. Partly Learned and Comprehended
4. Well Comprehended and Understood
5. Appreciated and Applied

The space at the bottom of each page is designed for teacher's "Notes." From the fourth grade up, it is suggested that teachers review the previous level to their own for student strengths and needs, focal points or quality indicators their students may have attained or missed in earlier grades. Teachers also may wish to familiarize themselves with the whole model in order to articulate learning at all levels.

The model's second part is an auxiliary publication devoted to "Resources." These are symbol and number coded to the statements in "Strengths and Needs." Thus, a teacher who identifies a need can turn to the "Resources" for suggestions as to strategies and activities for teaching the particular topic. A choice among procedures usually is offered. It is expected that in actual practice, the "Resources" will stimulate the teacher's imagination to find or create alternatives even more suitable.

Resources suggested are classroom tested and readily available. Readings, films, film strips, games, field trips, graphics, and other activities are identified, along with directions for obtaining them. But they are only a sample among the many teaching aids that have been devised. Preference here is given to free or inexpensive materials. The "Resources" are printed separately for each of the four grade levels — K-3, 4-6, 7-9, and 10-12.

STRENGTHS AND NEEDS

in TEACHING
NATURAL RESOURCES, CONSERVATION and ENVIRONMENT

Kindergarten through 3rd Grade
4th through 6th Grades
7th through 9th Grades
10th through 12th Grades

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17

Basic Concepts
Grades K-3

Concept 3

Human Beings are now the Most Influential of Earth's Organisms

Understanding Human Impacts on the Environment

We use so much water in so many ways that our waterworks rival in size some of the very big natural systems.

Air quality is greatly altered as a result of technologies people introduced as they industrialized their societies.

Human land use has shaped and changed large parts of Earth's surface, not only where we live but where wildlife is found.

Only people exploit nonrenewable energy resources very much, and for the last century we have doubled and redoubled the amount we use every few years.

The effects of human activities on the environment are obvious, but often have a greater impact than is immediately apparent.

Concept 4

Our Ability to Comprehend Must be Coupled with the Obligation of Self-Control

Understanding Human Responsibilities and Opportunities

Our great demand for fresh water contrasted with the limited amount existing in the world is the reason we should all use water wisely and not waste it.

Our responsibility to maintain air quality obligates us to make choices in the way we live — our cars, homes, industries.

Soil conservation is one of the oldest civilized practices. Soil conservation and land use planning are a major part of our obligation to ensure Earth's well being.

People's great demand on limited energy sources imposes a responsibility on everyone to eliminate waste and promote efficiency.

Looking beyond the appearance of human dominance on Earth, we see that each of us must be responsible for the careful and effective use of natural resources.

Concept 1

The Wholeness of Earth's Systems

Understanding the Biosphere

All water comes from precipitation, is in solid or gaseous form as well as liquid, and is necessary to all life.

Air is part of the miracle that coordinates the process by which plants and animals keep each other alive.

Soil, upon which terrestrial life's food chains depend, is formed by a very slow process.

Energy is the capacity to do work. Its sources, all derived from the sun originally, are renewable or nonrenewable.

The role of the four major elements in the biosphere can be expressed in a simple equation:
WATER + AIR + SOIL + ENERGY = LIFE.

Concept 2

The Effect of Ecosystems on Human Beings

Understanding Human Dependence on Nature

Water is one of the main reasons people settle, live, and work where they do. The total amount of Earth's water has never been changed.

Air helps maintain the balance of daily and seasonal changes in ecosystems. We live as we do because of those changes.

Soils fertile enough for the crops on which we depend make up only a tiny percentage, less than 5% of Earth's land surface.

People get their bodily energy from food, a renewable source. Most of the rest of the energy we use comes from nonrenewable sources.

The environment created by natural forces makes our way of life possible and determines what flora and fauna will share it.

Elements of Conservation Grades K-3

The gift package of enlightenment that a teacher brings to children during this stage of their education shapes their attitudes for the rest of their lives. One gift is an introduction to the splendors of the world around them, big as all outdoors and tiny as a mote dancing in a sunbeam. Another is respect for their environment. Imagination, the teacher's creative use of curriculum strategies and material aids, is gift wrapping that enhances for both giver and receiver the joys and wonders of the contents.

The following "inventory" of focal points for conservation education in Grades K-3 should serve to measure how many of the gifts your school curriculum package already contains. The order in which the items are placed in the following pages was chosen to facilitate this measurement. The order in which the specifics are taught is the teacher's choice. The "Resources" for this level offer suggestions for filling any gaps you find.

Rating Scale

1. Uninstructed or Uninformed
2. Beginning to Learn
3. Partly Learned and Comprehended
4. Well Comprehended and Understood
5. Appreciated and Applied

Concept 1
Grades K-3

THE WHOLENESS OF EARTH'S SYSTEMS

Notes

The grandeur of this concept dazzles many of us who are older than third graders. We would share the sensation with children, and one purpose of this model is to help teachers do just that. But we want to go on from there. Pupils who grasp the phrase's full meaning earn more than a sound basis for conservation education. They win a passport for exciting voyages of discovery that open the mind and the senses to the ever-changing, ever-lasting marvels of our unique little planet. So our first set of goals comprises nothing less than ....

Understanding the Biosphere

1. Earth and everything on it make up a single inter-related, interacting, interdependent global complex that runs on a simple equation:

WATER + AIR + SOIL + ENERGY = LIFE

2. For all its simplicity, this is an awesomely encompassing idea. A start toward mastering it is for children to learn that the Earth is whole as well as round.

WATER

1. All water comes from precipitation — rain, snow, hail, sleet.
2. Water is all-pervasive either as gas, liquid or solid. (Three-quarters of Earth's surface, two-thirds of a human body, etc., consists of water.)
3. Almost all life on land requires fresh water, yet there isn't all that much of it in the form and places we want it.
4. Abnormally heavy rains and prolonged droughts constantly change the amount of fresh water that nature bestows on any one region.

AIR

1. Air supplies oxygen and carbon dioxide, which are essential to all the life on Earth.

2. Air maintains a balance of these gases through a miracle of coordination to which both plants and animals contribute.
3. Air in motion helps keep Earth's other systems in balance. It takes rain to its destinations, carves out beautifully distinctive landscapes, even powers a windmill or a boat.
4. Birds and all creatures that use the air for flying are an integral part of the ecosystem.

SOIL

1. Soil directly or indirectly nourishes all life on land. It is one end of the food chain.
2. Soil appears upon the Earth as the result of a long, slow process of weathering and decay.
3. Minerals, ranging from base metals to gems, are found in many kinds of rocks.

ENERGY

1. Energy is the capacity to do work. This means work of all kinds — what makes wind blow, water flow, trees grow, the Earth spin.
2. The sun is the original source of all energy. Energy can be neither created nor destroyed on this Earth.
3. Some energy resources are renewable; others are not.

LIFE

1. Availability of water, air, soil, and energy in combination governs the development of life everywhere in the world.
2. Plants support all animal life. They draw nutrients and water from the soil, carbon dioxide from the air, and energy from the sun. Nature's "web of life" forms an intricately delicate balance.
3. One feature of the wholeness of the Earth is the slow change in an ecosystem, as from pond to marsh to thicket to forest.
4. Another aspect is the preservation of population balance among various species within an ecosystem.

Concept 2
Grades K-3

THE EFFECT OF ECOSYSTEMS ON HUMAN BEINGS

Notes

Expanding a child's knowledge of the natural forces that rule the Earth sparks curiosity — "What does all this mean to me?" This is likely to be the children's question, even if not verbalized, after a teacher has in effect stretched their minds to take in the vastness of the universe and to grasp the meaning of nature. So the next goal of conservation education is to study environment's major influences upon all of us. This is a challenge to both pupils and teachers. It calls for ...

Understanding Human Dependence on Nature

1. Where and how well most people live is dictated by the kind of ecosystem in which they are born or to which they migrate. (E.g., note the Eskimos and Pygmies, peoples of mountain and plain.)

2. Earthquakes, volcanic eruptions, tidal waves, and significant changes in climate may alter an ecosystem drastically. The inhabitants must adapt, migrate, or die.

WATER

1. The peculiar relationship of water to land has been decisive in developing civilization.
   A. Most of the world's great cities began as ports.
   B. Peoples who depend upon fish and other aquatic life have cultures strongly influenced by that fact.
2. Access to good fresh water dictated the sites of inland cities, many industries, and most farms.
3. However much we rearrange the distribution or flow of a river system, the total amount of water is only what the hydrologic cycle releases.

AIR

1. Daily and seasonal changes in air temperature prescribe much of what we do almost every moment of our lives.
2. The vagaries of air in motion may become matters of life and death, as when a gentle breeze swells into a tornado.

SOIL

1. Soils were almost as important as water in influencing the original location of human settlements.
2. People depend for nearly all their food and much of their fibers on fertile land that can hold water and nutrients for plants to absorb in the quantity we need. Soil of that quality is limited, 2-4% of Earth's land surface.
3. Minerals, basic material in many of the things we use, exist in fixed quantities and once taken from the ground cannot be replaced.

ENERGY

1. All human beings get their bodily energy from a renewable resource — food.
2. Industrialized societies depend for most of their energy on fossil fuels. These are non-renewable.

LIFE

1. The natural environment controls many factors that contribute importantly to our way of life — the style of our houses, food, games, clothes.
2. Wildlife is one of the ecosystem's natural resources upon which people depend.

Concept 3
Grades K-3

HUMAN BEINGS ARE NOW THE MOST INFLUENTIAL OF EARTH'S ORGANISMS

Notes

Young children's curiosity is a dependable natural resource for the education system, sometimes exhilarating, sometimes infuriating. As they familiarize themselves with their environment, they are not likely to be satisfied by asking merely, "What does it all mean to me?" They probably will go on to, "What do I mean to it?" If they do not raise the question spontaneously, it is easy to lead them to it. The power and majesty of natural forces should be kept in mind, however, as teacher and students reach for ...

Understanding Human Impacts on the Environment

1. We are neither the largest, strongest, hardiest, nor most agile creatures on Earth. Our dominant position as compared to other forms of life now on the planet is a product of intelligence and our ability to use tools (technology).
2. Technology coupled with work enables people to bend nature in many ways to suit their own convenience.
3. Human intervention in the environment causes many profound changes in the living world through:
   A. Domesticating plants and animals;
   B. Intruding on wildlife habitat, sometimes to improve it, other times to damage or destroy it.

WATER

1. People use fresh water in more ways and greater volume than do other forms of life.
2. Human demand for fresh water is so great that in size man-made waterworks rival all but the biggest natural systems. In consequence, they have great impact on the environment.
3. The changes we make in the quality, flow, and natural storage of water alter aquatic wildlife habitat significantly.

AIR

1. Application of technology has done some dreadful things to the air, but can also undo them.
2. Human values are weighed and debatable issues decided mostly by means of government. These values usually determine what happens to air.

SOIL

1. Land use has put the stamp of civilization on enormous sections of Earth's surface, especially on the soils that produce our food and fibers.
2. Farmers and gardeners often save and improve soil on sloping land which, left alone, would be claimed by water and wind erosion.
3. Land use has equally powerful impacts on wildlife. In one place, we may disturb the habitat, in another help the plants and animals to flourish.

ENERGY

1. Only people, among all living things exploit nonrenewable metals, minerals, coal, gas, and oil. This has left an indelible mark on many landscapes.
2. Human demand for these resources rises so rapidly on the wings of technology that in this century we have consumed more than did all our ancestors through all the millenia of history.
3. Different life styles and cultures have different energy needs and wants.

LIFE

1. Much of the immediate environment in which most of us spend our lives is our own creation, even the five needs of all life — food, water, shelter, space, and arrangement of these necessities.
2. An inescapable question about the impact of human activities on environment is: "What happens to other forms of life?" Wildlife is an excellent barometer for such a measurement.

Concept 4
Grades K-3

OUR ABILITY TO COMPREHEND MUST BE COUPLED WITH THE OBLIGATION OF SELF-CONTROL

Notes

"What does it all mean to me?" and "What do I mean to it?" lead quite naturally to "What can I do about it?" The attitude this question implies is the ripe fruit of conservation education. All that remains is for the child to discover constructive alternatives. The search will bring teacher and class to a confrontation with the realities of the human condition in our society. The glories of "Colorful Colorado" with its scenic beauty and fascinating wildlife make up one aspect. Another is the harshly defiling pollution, waste, and devastation that accompany certain triumphs of progress. The outcome need not be a host of militant third grade crusaders let loose upon the land. Nor even children with glib solutions to the problems of conservation. But what can be accomplished in these impressionable years is a solid foundation for ...

Understanding Human Responsibilities and Opportunities

1. Conservation is necessary for the sake of present and future generations of plants, animals, and people. Wise use of our resources (conservation) is *the* responsibility.
2. The opportunities to be identified are those in which youngsters of this age can participate.

WATER

1. Conserving this precious resource means detecting waste and inefficiency, using water wisely and accepting sacrifices.
2. Conservation may also require adjusting activities and life styles to prevent water pollution, especially through waste disposal.
3. The trade-offs and decisions involved are neither easy nor clear. (We can make water so clean that fish can't live in it.)

AIR

1. Air pollution problems pose more trade-offs and more decisions:

A. The automobile; B. The home; C. industries, including utilities.

SOIL

1. Soil care was the earliest conservation practice, applied in many cultures from ancient Egyptians to American Indians.
2. Careful farming practices, including replenishment of nutrients in the soil, conserve and enhance productivity. But we still must make hard choices. Farmers, for example, select a method of cultivation from among several options.
3. The scarcity of minerals means that we must use them carefully and re-use them whenever possible.

ENERGY

The values and issues at stake in energy conservation are the same as those for water conservation:

1. Recognizing wasteful or inefficient uses, converting to wise uses, accepting possible sacrifices.
2. Adjusting activities and life styles to prevent pollution.
3. Making the inevitable trade-offs and decisions.

LIFE

1. Conservation starts with the individual in everyday life. No one is so young nor so old, so busy nor so privileged as to be exempt.
2. We have a particular obligation to wildlife because we have taken so much of their territory. Children are likely to acquire a special appreciation of this as they develop awareness of sound wildlife management principles.

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Basic Concepts
Grades 4-6

Concept 3

Human Beings are now the Most Influential of Earth's Organisms

Understanding Human Impacts on the Environment

People almost always redistribute water flow solely for the purpose of supplying their own demands.

Our use of air for fast transportation and waste disposal affects all living things as well as our own well being.

Land-use practices have protected and improved some soils, damaged others, and taken still others out of production.

Our accelerated use of fossil fuels and some minerals has brought us within measurable distance of the end of these resources.

An industrialized society's activities largely determine which species of plants and animals flourish and which decline within an ecosystem.

Concept 4

Our Ability to Comprehend Must be Coupled with the Obligation of Self-Control

Understanding Human Responsibilities and Opportunities

Increasing demands on water supplies require trade-offs and sacrifices to make sure we have enough for essentials.

All our choices for maintaining acceptable air quality involve either significant costs or reduced use of polluting machines.

Stewardship of the land calls for soil conservation on farm, range, forest, city, mine, highways — everywhere.

Our obligation to maintain adequate energy supplies can be summed up. Consume less; recycle more.

All these responsibilities mean that it is up to us to preserve, protect, and improve the quality of life — all life.

Concept 1

The Wholeness of Earth's Systems

Understanding the Biosphere

All the water in the world was originally fresh. Salt and other minerals washed into it from the land as the hydrologic cycle was established.

Air's weight, movement, and temperature help to control the rain and the seasons — what the ecosystem will be.

The kind of rocks from which a soil was made is a key to the life it will support — plants, animals, and people.

Energy sources began to accumulate in and on the Earth even before the continents took their present shape and the energy balance that maintains the world was established.

All life is nourished directly or indirectly by plants. These require water, air, soil, and energy to survive.

Concept 2

The Effect of Ecosystems on Human Beings

Understanding Human Dependence on Nature

The amount of water that falls on the Earth and where it falls are, so far, beyond human control. We must take what nature gives.

Air quality, movement, and temperature constitute a major factor in determining where people live — and how they live.

The composition and grade of soils are equally decisive in supporting all forms of life.

The limited nature of nonrenewable energy sources has a tremendous impact on our life styles and prospects.

Human societies developed in various ways because ecosystems produced different types of plants and animals in different places.

Elements of Conservation Grades 4-6

Children acquire certain basic information and develop understanding about the Earth, its structure, and its inhabitants in Grades K-3. The paths of learning widen and branch out in Grades 4-6. The results of their explorations are greater appreciation of natural forces and resources, an enlarged sense of responsibility, a willingness and desire to conserve, even a glimpse of infinity.

Rating Scale

1. Uninstructed or Uninformed
2. Beginning to Learn
3. Partly Learned and Comprehended
4. Well Comprehended and Understood
5. Appreciated and Applied

Concept 1
Grades 4-6

THE WHOLENESS OF EARTH'S SYSTEMS

Notes

A sense of how the Earth came into existence, what it is made of, and the steps that led to its present composition and conformation are the gist of this concept. The relationships of water to land, of both to the atmosphere and sun, and of the living to the inanimate were touched upon in the K-3 Model. Now perception is intensified and broadened as students advance toward ...

Understanding the Biosphere

1. Earth, born as a ball of flaming gases flung off by the sun but kept under its control, went through many transformations. As it cooled and solidified and received its deluge of water, land masses heaved and shifted into the present pattern of continents and islands, mountains and valleys.
2. Life seems to have first appeared in the oceans and spread to land.
3. The interplay of similarities and differences within nature is the key to the characters of Earth's ecosystems.

WATER

1. All the water originally was fresh. Salt and other minerals washed into it from the land, a process still going on. In places where seas evaporated, salt and other deposits were left on the land.

   A. This reinforces and amplifies what may have been learned about the hydrologic cycle earlier. (See Grades K-3, 1 Water1.)
2. Falling water affects the land, the effects varying with the amount and intensity of the precipitation.
3. Flowing water affects the land in equally important ways.

AIR

1. Air's composition and qualities — the gases in it, the way it moves, its weight — are vital environmental factors.
2. Air pressure, flows and temperature are especially important in determining where rain falls, snow accumulates, and seasons change.

SOIL

1. The composition of any soil depends upon the kinds of rocks that are its basic ingredients.
2. Only a relatively small proportion of the land has soils capable of feeding big populations.

ENERGY

1. The exchange and balance of energy in nature sets up Earth's many different climates, determining where seasonal changes will take place and what those changes will be.
2. Energy storage in the form of coal, oil, and gas was a long, slow process which, for all practical purposes, makes these fuels non-renewable.
3. Other forms of energy exist — solar heat, geothermal, nuclear, wind, tides, even garbage.

LIFE

1. All forms of life depend on the four natural resources — water, air, soil, and energy — in some combination.
2. Through photosynthesis, plants manufacture the proteins and starches that sustain them and make them the basic renewable resource to feed and shelter animals.
3. Plants and animals in every ecosystem live as an intricate web of strong competition and profound interdependence.
4. Wildlife in its natural habitat illustrates this competition and interdependence of living things, as well as the ways in which nature regulates population growth.

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Concept 2
Grades 4-6

THE EFFECTS OF ECOSYSTEMS ON HUMAN BEINGS

Notes

The degree to which people, no matter how civilized and technologically advanced, are controlled by their natural environment is often not apparent in our highly industrialized society. We are reminded of it when some unpredictable cataclysmic combination of elemental forces strikes. A less devastating route to full appreciation of the ecosystem's power to mold human destiny may be grasped through ...

Understanding Human Dependence on Nature

1. Every environment has its own particular impacts and influences on the life styles of the people who inhabit it. Culture is in many ways a product of the ecosystem.
2. People learned to adapt to their environment long before they could modify it.
3. Even after we have learned to modify the environment, we remain subject to the laws of nature.

WATER

1. Although we can and do redistribute the water of whole river systems (the Colorado, for example), the amount and timing of the precipitation that supply the river are outside human control, thus limiting our activities.
2. The effects of such devices as cloud seeding so far have been debatable.
3. Colorado's major watersheds depend far more than those of most other states on snow's spring melt rather than rain. The amount of precipitation varies widely. The high mountains get most.
4. Unpredictable qualities of the hydrologic cycle force us to allocate and conserve water.

AIR

1. Very hot air and very cold air severely restrict human habitation.
2. Elsewhere the air may have either good or bad effects on people — the steady trade winds, violent storms, gentle breezes, uncomfortable temperature inversions.
3. Air as a carrier of dust and pollen helps maintain plant life.

SOIL

1. Soil quality can foster or destroy a civilization.
2. The slow process of soil formation severely limits areas suitable for the intensive cultivation upon which large modern populations depend.
3. Soil supplies the nutrients for plants and the support for their stems.

ENERGY

1. The limited, nonrenewable nature of fossil fuels and metals causes people to settle in places and resort to expedients that are often unpleasant.
2. The search for new reserves of fossil fuels, for alternative renewable energy sources, and for substitute minerals or synthetics also has its impacts on human life styles.

LIFE

1. Each of Earth's ecosystems developed animal and plant life that helped to shape the particular culture that evolved there.
2. Colorado has abundant examples of how cultural diversity developed.

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Concept 3
Grades 4-6

HUMAN BEINGS ARE NOW THE MOST INFLUENTIAL OF EARTH'S ORGANISMS

Notes

If students are humbled by their awareness of nature's overwhelming power, the feeling may be reversed as they familiarize themselves with changes that human ingenuity and technology have made in the natural environment. What people do determines the disposition of resources that support all life far more than what other living organisms do. The sense of awe and wonder that is developed by intelligent contemplation of the universe can almost be duplicated through ...

Understanding Human Impacts on the Environment

1. People developed their ability to change the environment by exploiting natural resources as no other form of life does.
2. While man-made changes in ecosystems grew throughout recorded history, the acceleration in this century is unprecedented.
3. A review of the human qualities that made this possible is desirable.

WATER

1. The water of major watersheds has been distributed artificially to supply people's wants — arbitrarily as far as some other forms of life are concerned. Recently some of our decisions include provisions for wildlife.
2. Whether we preserve and improve water quality as we use it or degrade and pollute it has a major impact on us as well as on plants and animals.

AIR

1. We must accept our air in the condition supplied by the ecosystem, but we do not always leave it that way.

2. Man-made air pollution can damage human lives and property. It also affects other forms of life.

SOIL

1. Soil, like air and water, can be protected or damaged according to the way people use it.
2. The uses to which we put the soil also change much of the natural environment whether what we do is farming, grazing, lumbering, mining, urbanization, transportation, or recreation.

ENERGY

1. Extraction of fossil fuels, minerals and metals has had a major impact on agriculture, forests, native plants, and wildlife.
2. Our accelerated consumption has brought us within measurable distance of the end of these resources.

LIFE

1. Human impacts on the environment in industrialized societies often determine which species of plants and animals flourish or survive and which decline or vanish.
2. Wilderness and wildlife management in Colorado illustrates one phase of this human impact on the environment.
3. Every community in Colorado is a clear example of how the development of our life styles generally affected the ecosystem.

Concept 4
Grades 4-6

OUR ABILITY TO COMPREHEND MUST BE COUPLED WITH THE OBLIGATION OF SELF-CONTROL

Notes

The more students learn how natural forces and resources affect us and how we use them, the clearer will be the youngsters' judgment in reaching conclusions about conservation. They are not likely to be unanimous in those conclusions. But rational judgments can be achieved through ...

Understanding Human Responsibilities and Opportunities

1. Conservation means the wise use of resources.
2. The benefits of Earth's natural resources can be extended by the practice of conservation, socially and individually.
3. Although conservation means different things to different people, it may be useful to try to reach agreement on human responsibilities.

WATER

1. Water priorities are set through popular or governmental decisions on supplying competing claimants — agriculture, cities, industries, flood control, transportation, recreation, wildlife.
2. Increasing demand on limited supply decrees that each priority granted involves trade-off, sacrificing or diminishing another use of water.
3. In these decisions, non-polluting uses, purifying practices and re-use become increasingly important.

AIR

1. Current practices that pollute the air pose another set of problems and conflicts. Causes of debate include:

   A. Motor vehicle emissions; B. Industrial emissions; C. Space heating; D. Burning waste.

2. Costs and trade-offs are involved in reducing or preventing air pollution.

SOIL

1. People's responsibilities for soil conservation lie in wise use and management of the land whether for farming, forest, wilderness, mining, urbanization, recreation, or anything else.
2. We face other responsibilities when contemplating alterations in land as:
   A. Changing forest, marsh, or grassland to cropland or reservoirs;
   B. Converting prime farms into sites for buildings, highways, etc.

ENERGY

1. The more we deplete nonrenewable sources, the more important conservation becomes.
2. Differences in conservation principles are demonstrated by wise and unwise uses of energy in the local community.
3. Problems of priorities and trade-offs arise.

LIFE

1. The stakes in conservation of natural resources are the growth of cities and industry, the productivity of argiculture, our enjoyment of leisure, the preservation of wilderness and wildlife, and the well being of future generations of all living beings.
2. Opportunities for students to promote and practice conservation exist in the school, the home, and the local community.

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Basic Concepts
Grades 7-9

Concept 3

Human Beings are now the Most Influential of Earth's Organisms

Understanding Human Impacts on the Environment

Technology used as a tool redistributes whole river systems. It rests with us to keep the water clean.

People's principal effect on air is to impair its quality. Then we deplete other resources trying to clean it.

People's use of land, whether destructive or constructive, has altered many of Earth's features.

The ways people use energy and the quantities they consume govern life styles and decide the fate of almost everything.

In adapting to Earth's systems, especially by use of technology, people have changed the quality of all life.

Concept 4

Our Ability to Comprehend Must be Coupled with the Obligation of Self-Control

Understanding Human Responsibilities and Opportunities

The wise use of water so as to serve our needs and the needs of all life is conservation.

Our first conservation duty to the air is to work toward leaving it as clean as we find it — or cleaner.

Soil will continue to supply our needs only if we as individuals and groups consistently practice soil conservation.

The degree to which we save energy will largely determine how many of our energy-consuming appliances and comforts we can keep.

The quality of life — all life — will be influenced increasingly by our respect for natural resources and our sensible use of them.

Concept 1

The Wholeness of Earth's Systems

Understanding the Biosphere

The all-pervasive element, water, constitutes the real life fluid. It also stores energy and equalizes climate.

Knowledge about the weight, temperature, and movements of air and about the gases that compose it is a key that unlocks the doors of environmental quality.

Soil is formed by the very slow process of wearing rock down to fine particles, supplemented by plant and animal decomposition.

As basic as the laws of thermodynamics are the facts that nonrenewable energy sources are finite and renewable ones can be managed infinitely.

The biosphere is hospitable only to those forms of life that can adjust to it. Few species survive very long by geological standards.

Concept 2

The Effect of Ecosystems on Human Beings

Understanding Human Dependence on Nature

Less than 1/2 of 1% of the world's water is fresh in usable form. Forces beyond our control govern its global distribution.

Air, necessary to all life, is important in our climate, our work, and our play.

The more highly industrialized and populous a society, the greater is its need of the soil's produce.

The story of civilization is largely the story of human shifts from one energy source to another — wood to coal to oil to ???

In many ways, human beings are as dependent upon their ecosystems as any animal.

Elements of Conservation Grades 7-9

Junior high school students have an opportunity to relate the principles of conservation in the broadest sense to their everyday lives. They can extend their actual participation in conservation practices beyond school and home into some aspects of the larger community, the neighborhood or town. Conservation principles are at the heart of the model. The material suggested is designed to be woven into the fabric of the full range of courses taught in Grades 7-9.

Rating Scale

1. Uninstructed or Uninformed
2. Beginning to Learn
3. Partly Learned and Comprehended
4. Well Comprehended and Understood
5. Appreciated and Applied

Concept 1
Grades 7-9

THE WHOLENESS OF EARTH'S SYSTEMS

Notes

The Earth's functions create such phenomena as four seasons in some parts of the world but not in others. The solar system's forces decree that one region on Earth is wet and another dry, one warm and another cold, one hospitable to many forms of life and another to relatively few. Yet all remain integrated in a unified but ever changing global complex. The effects that students may perceive upon their own lives and futures evolve from ...

Understanding the Biosphere

1. Year after year the world's many ecosystems operate within the framework of their special characters through the interplay of forces that include:

   A. Earth's rotation on its axis at a constant speed;

   B. The tilt of that axis at 23½° from perpendicular to the plane in which Earth rotates;

   C. Earth's orbit around and distance from the sun;

   D. Prevailing winds and atmospheric pressures.

2. The upheavals and subsidings of Earth's crust before it reached its present conformation created distinctive environmental features. E.g., Colorado was ocean bottom at least three times.

3. Many of these changes profoundly influenced life forms; most of those we know developed in the last few million years.

WATER

1. Water has a great equalizing effect on climate. Partly this happens because so much of Earth's surface is ocean. Another reason is inherent in water's properties:

A. It condenses as it cools to a point, then expands as it cools further. Almost everything else continues to contract the colder it gets.

B. Water can store vast amount of energy (heat).

C. Water is an almost universal solvent.

2. Aquatic life is especially important in Colorado. Significant variations in plants and animals occur in cold and warm waters.

AIR

1. The gases of which air is composed are a key to all life. Each main constituent has special properties.

2. Air's weight is a major factor in the environment; water vapor is the heaviest component, but the others have weight, too.

3. Air renews itself through an intricate process. Living things are part of it.

SOIL

1. All soils are derived from one of the three basic rocks that compose Earth's crust — sedimentary, igneous, metamorphic.

2. Nature has its own ways of maintaining and redistributing soil:

   A. Plant cover and flat or gentle slopes keep soil in place.

   B. Wind and water erosion move soil around, eventually washing it into the oceans.

   C. Soil renews itself very slowly as rocks wear down to particles and plant and animal decay adds major ingredients.

3. Colorado soils which are not held in place by land formation and slope, by forests, or by vegetation are susceptible to permanent loss. The washed away soils of Colorado are deposited in the Gulf of California and the Gulf of Mexico.

ENERGY

1. Energy is of two kinds, although the sun is the source of both. Kinetic energy is that which is manifest as either heat, light, or motion. Potential energy is that which is stored, as in food, fuels, batteries, the nuclei of atoms, water held behind dams.
2. The three types of energy sources are:
   A. Continuous (solar, geothermal, tides, winds);
   B. Renewable (food, wood and other growing things that burn);
   C. Nonrenewable (coal, oil, natural gas, metals — which cannot be grown).
3. Regardless of source, energy is never lost, only changed — first law of thermodynamics.
4. Conversion of energy from one form to another involves some loss of heat — second law of thermodynamics.

LIFE

1. Each environment is hospitable only to those forms of life that can adapt to its particular climate, soils, air, and water. Plants and animals are still changing form in order to adapt.
2. Within each environment, an important feature of the adaptations is for every plant and animal to take its place in the web of life.
3. Wildlife habitat needs are not unlike those of human beings. The five indispensable components are water, food, shelter, space, and arrangement of these four.

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Concept 2
Grades 7-9

THE EFFECTS OF ECOSYSTEMS ON HUMAN BEINGS

Notes

Awareness of how the biosphere's major forces operate leads logically to appreciation of their tremendous impacts. All human societies and every individual are affected. The proof is all around us — in the conformation of the land we occupy, in our proximity to the ocean, in the nature of the soil from which we get our food, in the weather everybody talks about but doesn't do anything about. Just why all this is so important becomes clear as students approach ...

Understanding Human Dependence on Nature

1. Such features of our natural environment as climate govern much of our lives, and cannot be modified by any human efforts.

2. The more advanced a society becomes technologically, the more its people can adapt to unfavorable conditions in their environment.

3. It is much simpler for people to accept whatever nature provides and live with it than to overcome natural obstacles and limitations.

WATER

1. The world's fresh water resources, although a tiny fraction of the total, dictate where most human beings live because every one of us is completely dependent upon water.

2. Water in the ground is as important as water on the surface and in the atmosphere. There is also a lot more of it.

3. The hydrologic cycle governs the supply we use.

AIR

1. We need air to breathe and it is equally important to plants and animals. Plant transpiration is absolutely necessary for human survival.
2. Air is also essential in much of our industry and in many forms of recreation.
3. Air is a key factor in the climate in which we live — its temperature, its pressures, its movements.

SOIL

1. The more highly industrialized and populous a society, the more products of the soil it needs — food, fibers, wood, and minerals.
2. Key consideration for supplying food, fibers, and habitat are the soil's depth, texture, porosity, salinity or alkalinity, organic content, and nitrogen.
3. The natural dangers to which soil is subject — erosion, depletion of nutrients, excess salts, insufficient moisture — oblige us to take protective or rehabilitative measures.

ENERGY

1. The adoption of a new or different energy source often changed the whole history of civilization, and can do so again.
2. The future of human society depends in the long run upon the next great energy source.

LIFE

1. The ecosystem's forest, wilderness, and wildlife are important aesthetic and important recreational assets.
2. Renewable natural resources largely determine the life styles and cultures of primitive peoples.
3. Today as in the past, these resources are the basis of industries and therefore, jobs.
4. The principal food crops that a given region grows best because of its special ecosystem strongly affect local life styles — as a rice culture in contrast to a grain culture.

Concept 3
Grades 7-9

HUMAN BEINGS ARE NOW THE MOST INFLUENTIAL OF EARTH'S ORGANISMS

Notes

Technology directed toward satisfying human wants is the only substantial force outside of nature that extensively modifies the environment. A common complaint is that we are better at creating the technology than using it wisely. An informed judgment as to whether or not this is so calls for exact information on what we have done to the natural environment. The model suggests students take the following route to ...

Understanding Human Impacts on the Environment

1. People exercise their greatest influence upon ecosystems through their technology.
2. The increase in human populations, especially in the last century, has altered much of Earth's face.
3. The condition of wildlife illustrates in very special ways the attitude and behavior of people where conserving the environment is concerned.

WATER

1. Uses that pollute water supplies — industrial, agricultural, and urban waste mainly — are one of technology's main impacts. Yet technology also has helped to restore and preserve water quality.
2. Irrigation in the U.S. has become the greatest user — and re-user — of water in the country.
3. Modern dams, tunnels, drills, and pumps enable us to redistribute water in far greater volume and over greater distances than was ever possible previously.
4. The impact of people on water resources is demonstrated by learning where the local water supply comes from and where it goes.

AIR

1. The quality of air, at least near Earth's surface, is impaired in varying degrees as the result of technology. Industry, transportation, and waste disposal are the chief despoilers.
2. The undesirable impact of technology upon air quality inspires human attempts to reverse the process. The recent history of any big city or industrial complex illustrates this.

SOIL

1. The impact of technology has been destructive when applied so as to increase erosion or deplete nutrients, but remedial or productive when applied according to the soil's particular needs.
2. Grasses, by far the greatest source of human food, exemplify our interaction with nature's systems.
3. Local land use patterns, whether or not farms are displaced, illustrate human impacts on the soil.

ENERGY

1. Our influence on the environment comes chiefly from the ways we use energy and the amount we consume.
2. People's decisions on energy uses in one generation affect the energy resources available to future generation.
3. The different life styles people choose call for different amounts of energy, and so have different impacts on the environment.

LIFE

1. Human diversion and use of natural resources can benefit or harm wildlife.
2. People have drastically changed both the animal and plant species of vast sections of the country — Colorado included. We raise corn, wheat, and alfalfa in place of native grasses; graze cattle and sheep where bison, elk and deer once thrived.
3. Wildlife management is especially important for both game and nongame species in Colorado.

Concept 4
Grades 7-9

OUR ABILITY TO COMPREHEND MUST BE COUPLED WITH THE OBLIGATION OF SELF-CONTROL

Notes

Insight into the biosphere's workings, the dependence of the human race on nature, and the impacts of people on their environment might indicate that appropriate conservation measures are obvious. Yet the wisest use of natural resources often is unclear and nearly always debatable. Students can prepare to take part in the debate intelligently by ...

Understanding Human Responsibilities and Opportunities

1. We all recognize the importance of conserving natural resources (using them wisely) but differ over what should be conserved and how.
2. However our attitudes impel us to answer *what* and *how*, we will be involved in:
   A. Assigning priorities among competing users;
   B. Arranging trade-offs, often economic, after deciding which of our needs or desires to satisfy;
   C. Encouraging or helping the search for alternatives to items in short supply.
3. In Colorado, one way of seeing these problems clearly is through studying their effects on wildlife.
4. Organized conservation is relatively new in the U.S. Its history since the late 19th Century helps explain today's issues.

WATER

1. Wise management of fresh water resources involves:
   A. Preventing and reversing pollution;
   B. Allocating supplies to essential and best economic uses;
   C. Eliminating waste and promoting re-use.

2. The attitudes needed for such management principles can be illustrated by applying them to:
   A. Local conditions in home, school, and community;
   B. Nearby aquatic wildlife.

AIR

1. Our obligation is to maintain air quality in as good condition as we find it. The first step is to determine what this goal requires of us, economically as well as socially.
2. Some communities control air pollution better than others.
3. Every individual can participate in a clean air campaign.

SOIL

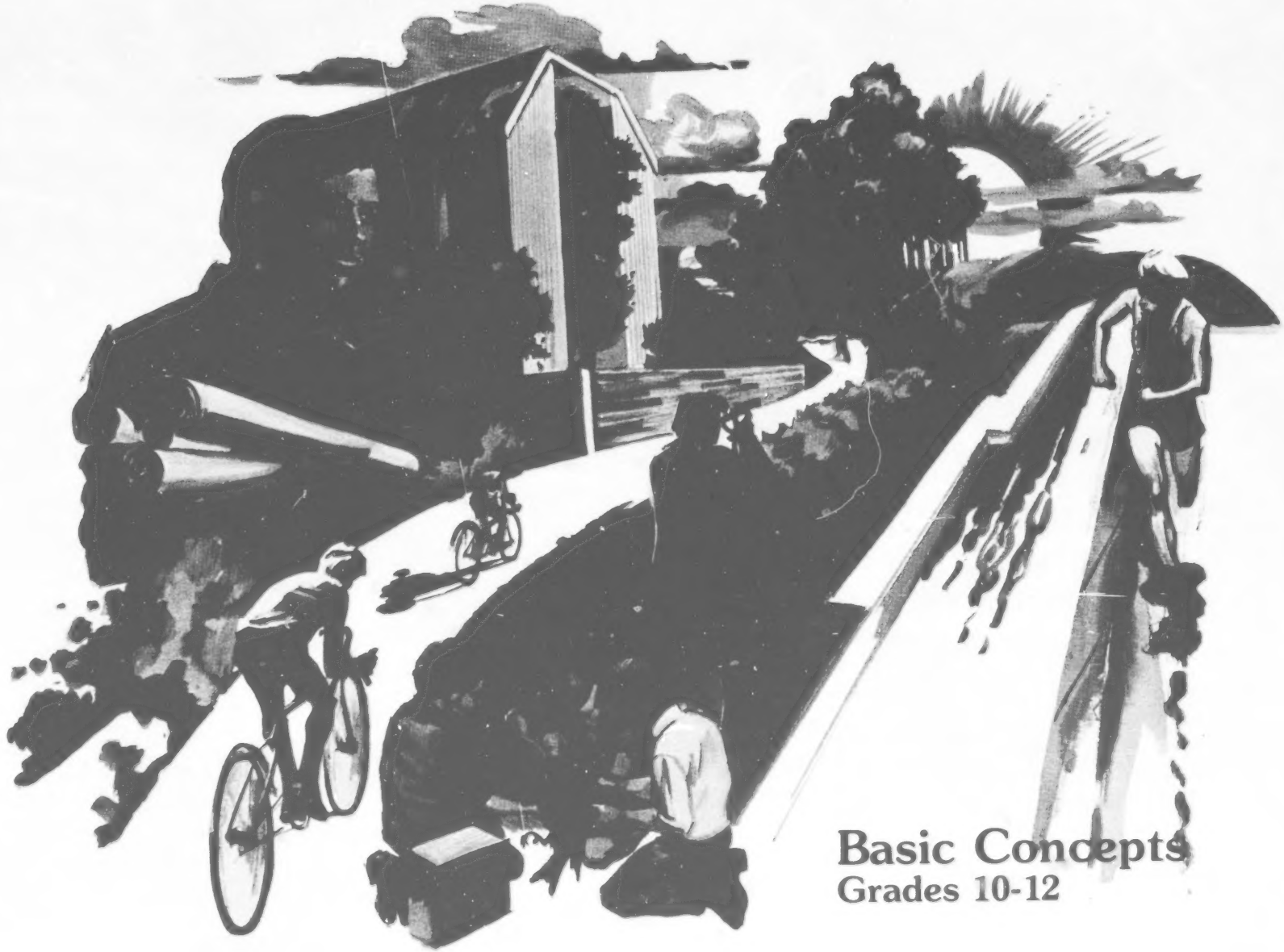
1. Major soil conservation measures are:
   A. Reducing erosion;
   B. Maintaining or restoring plant nutrients in the soil;
   C. Maintaining or improving soil moisture content.
2. Individuals and the groups to which they belong have a role in soil conservation even if not farmers, ranchers, or foresters.

ENERGY

1. The need to conserve energy for any other reason than to save money is a fairly new idea in this country. Many organizations, public and private, now engage in energy conservation programs on ecological as well as economic grounds.
2. Specific energy conservation issues and opportunities are:
   A. Recycling things that take a lot of energy to produce;
   B. Turning the switch to "off;"
   C. Converting to appliances and activities that need only a little energy from those that use a great deal;
   D. Dealing with transportation, the most debated energy conservation issue in the U.S.

LIFE

1. Conservation of resources deserves to be a major goal of all land management, from a city or suburban yard to all public lands. Farms, range, wilderness, urban developments, highways are included.
2. The quality of life depends upon the degree to which we carry out our obligations and seize our opportunities to conserve natural resources.



Basic Concepts
Grades 10-12

Concept 3

Human Beings are now the Most Influential of Earth's Organisms

Understanding Human Impacts on the Environment

We redistribute, recycle, rearrange, and reinforce natural supplies of water with powerful effects on the environment.

People through technology sometimes impair air quality, but that does not have to happen.

People's use of land has altered natural soils all the way from greater productivity to none at all.

The energy sources we choose to use have environmental effects that are matters of life and death to us and to the plants and animals that share our world.

Applying technology to the management of territory we control helps some plants and animals to flourish, diminishes other species, exterminates still others.

Concept 4

Our Ability to Comprehend Must be Coupled with the Obligation of Self-Control

Understanding Human Responsibilities and Opportunities

Every one of us can play a part in sustaining and purifying our community's water supply.

Everyone talks about air pollution. Every individual can do something about it.

Soil conservation and intelligent land use involve serious cost/benefit decisions.

The value judgments we make as individuals are vital to the efficient use of energy and to the search for new renewable energy sources.

Self-control in the use of natural resources and respect for the environment are conditions of sustaining life as we know it.

Concept 1

The Wholeness of Earth's Systems

Understanding the Biosphere

The importance of water is in its volume, qualities and myriad uses.

The atmosphere's role in the biosphere is a function of air's density, gaseous components, and movement.

Soils are changed and renewed by a natural law of succession that is important to the food supplies of all living things.

The nature of energy and its conversion from one form to another governs Earth's ecosystems.

Change is a fundamental feature of the biosphere. Population dynamics are one of the most important elements.

Concept 2

The Effect of Ecosystems on Human Beings

Understanding Human Dependence on Nature

The workings of the water cycle dictate where people live, work, and play.

Air is for more than breathing. It regulates climate and is as essential to all life as to ourselves.

The quality of soil is a major factor in determining where people live and civilizations develop.

The distribution and availability of energy sources are decisive factors in our economy.

Natural laws, of which change is only one, are as binding on people as on all other forms of life.

Elements of Conservation Grades 10-12

As young adults in the community, high school students can be particularly effective in conservation. The model for these grades stresses preparation for such a role. It also provides more opportunities for independent work than did the earlier sections. The suggestions for activities are designed to encourage and strengthen participation in both public and private conservation efforts.

Rating Scale

1. Uninstructed or Uninformed
2. Beginning to Learn
3. Partly Learned and Comprehended
4. Well Comprehended and Understood
5. Appreciated and Applied

Concept 1
Grades 10-12

THE WHOLENESS OF EARTH'S SYSTEMS

Notes

The goal of conservation education is an informed citizenry, motivated toward the best use of natural resources. The citizen who is also a high school student can attain the objective by combining academic studies and conservation values with active involvement in the community. The first step is ...

Understanding the Biosphere

1. The biosphere is stable, operating through a highly complex but orderly, interacting, interdependent system of natural forces and resources.
2. Ecosystems are also fragile, subject to great and even violent change through an alteration in one or more natural forces.
3. The stable and fragile features of the student's environment will disclose how the ecosystem operates.

WATER

1. A major factor contributing to the wholeness of the Earth's systems is the interdependence of sea and land.
2. The hydrologic cycle furnishes a surplus or deficit of fresh water to every locality. These can be calculated precisely.

AIR

1. The envelope of air enclosing the world has many functions. It regulates such biospheric routines as the amount of sunlight admitted to the Earth and the transportation of water vapor from areas of evaporation to areas of precipitation

2. How atmospheric conditions operate to create weather is illustrated by the special influence of Arctic air on Colorado.

SOIL

1. Soil naturally builds and renews itself through the weathering of rocks and the decomposition of plants and animals.
2. Soils naturally are depleted or changed by a process of succession; they can be shifted and their composition altered by erosion.
3. The quality of natural soil — especially the depth, texture, porosity, salinity, and nutrient content — is of vital importance to every locality.

ENERGY

1. The nature of energy and its conversion from one form to another may need to be reviewed, including the first and second laws of thermodynamics.
2. The sources of energy are many, some renewable and others not.
3. The distribution of these resources is uneven, and some are more continuously apparent than others. Sun and wind are always obvious; coal and oil only when you look for them.

LIFE

1. Change is the biosphere's law of life. It is usually slow and gradual but may be rapid, as in the succession of life that appears on a bare vacant lot or in a forest after a fire.
2. The needs of all wildlife are food, water, shelter, and favorable arrangement of these in space.
3. Population dynamics for plants and animals are an orderly progression in which birth, life, and death are equally indispensable.
4. The forces operating the biosphere can be studied through plants and animals indigenous to the locality.

Concept 2
Grades 10-12

THE EFFECTS OF ECOSYSTEMS ON HUMAN BEINGS

Notes

After learning the environmental conditions which dictate the species of plants and animals any region can support, students may question whether the same conditions apply to the human race. How much we rely upon the ecosystem for those necessities — the degree to which the ecosystem controls our numbers and the way we live — becomes apparent through ...

Understanding Human Dependence on Nature

1. The force of the ecosystem's hold over us becomes most evident when something happens — drought, flood, famine, hard times.
2. Populations tend to be concentrated in places with the most favorable habitats for human beings, a tendency we share with the whole animal kingdom.
3. The local community is an example. Students can examine favorable and unfavorable features of their own natural environment.

WATER

1. Water historically determined the location of human habitation, from the tribe beside a clear stream to cities with natural harbors.
2. Tidal waters — estuaries, bays, salt marshes, shallows, and sand bars — moulded the civilizations of large coastal areas.
3. The effect of nature's fresh water supply on the development of a local community can be traced. Start by calculating the local surplus/deficit pattern.

AIR

1. Air masses bring our weather, and we have to live with it. In many places, we are helpless against windstorms.

2. Air temperature and movement influence various industries — fruit crops on the Western Slope, location of factories in the Denver area, entire communities. What is the situation in your region?

SOIL

1. Soil characteristics determine the life styles and numbers of people all over the world — we speak of "the Fertile Crescent" or "America's breadbasket."
2. Destruction or serious damage to the soil by natural causes can compel large communities to abandon their land.
3. The influence of soil types upon the community in which the school is located illustrates the point.

ENERGY

1. The introduction of a new or previously little used energy source has repeatedly altered a people's way of life.
2. Energy distribution has significant effects upon the economy. Changes may create or destroy jobs, enlarge or diminish profits, aid or hamper technological development.
3. Energy distribution creates political problems, national and international.
4. The distribution and exploitation of its energy resources are especially important in Colorado.

LIFE

1. The forms of life upon which we depend, primarily for food, are as greatly affected by the ecosystem as we are.
2. Wildlife resources are an important element in our economy and recreation, as well as in our appreciation of the beauties of nature.
3. These effects upon people can be illustrated through the study of local wildlife whether your school is in an urban or rural setting.

Concept 3
Grades 10-12

HUMAN BEINGS ARE NOW THE MOST INFLUENTIAL OF EARTH'S ORGANISMS

Notes

Before students can carry their full share in conservation, they should be aware of how human uses of natural resources have affected the environment. They probably know that our technology and increased demands for all sorts of material goods and service have far exceeded those of past generations. They also need to know how meeting those demands altered the physical world. They may gain this knowledge by ...

Understanding Human Impacts on the Environment

1. Changes people bring about in an ecosystem are perceived differently by different groups and individuals.
2. In our interventions in natural processes, we act on the basic tenet of justice: innocent until proved guilty. Is this still valid in ecology?
3. The impact of human intervention upon the natural resources of the state or the area in which you live can be studied as a case in point.

WATER

1. In satisfying our needs for fresh water, we changed the natural flow so greatly that original courses often are unrecognizable. Colorado offers many examples.
2. Water laws determine what happens and who controls the water in large areas of the country.
3. The impacts of human use and re-use of water depend upon the care we take to preserve its quality:

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A. With non-degradable wastes from farm and factory;

B. By filtration and purification.

4. The problems can be reduced to more readily comprehensible proportions by studying the local community's water system.

AIR

1. Pollution of air by people's wastes, machines, and manufacturing processes is a problem of long standing.
2. Efforts to prevent or reverse pollution are also part of our impact on the environment.
3. Local air quality can be analyzed to point up the significance of people's interference with this vital element.

SOIL

1. The type of cultivation farmers choose can save or destroy topsoil. (By one method, a layer 8 inches thick can grow good crops for 36 years; by another, for 22 centuries.)
2. From ancient times, people's use of land caused the rise — and fall — of civilizations.
3. Modern land-use proposals often are difficult to resolve because of the effect they will have on soils. Trade-offs often are inevitable.
4. Illustrations from local land use can be found — in conversion of range or swamp or forest to farms, or farms or range to urbanization, or any of these to highways.

ENERGY

1. Energy decisions made by one government entity have environmental consequences which may be felt in areas over which that entity has no jurisdiction.
2. The effects of human uses of energy on the environment can be predicted and measured.
3. Environmental consequences of people's consumption or production of energy can be studied independently in the local community.

LIFE

1. Our intervention in the environment has changed original plant and animal distribution, their numbers, and their habitat.
2. People apply scientific knowledge to managing plant resources — cultivated crops most obviously, but forest, marsh, and prairie, too.
3. Wildlife managers also apply scientific knowledge to the improvement of habitat in the interest of the animals as well as of people.
4. These points can be illustrated by investigating changes in the types of plants and animals in the locality.

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Concept 4
Grades 10-12

OUR ABILITY TO COMPREHEND MUST BE COUPLED WITH THE OBLIGATION OF SELF-CONTROL

Notes

The practice of conservation proves the effectiveness of conservation education. Since the model is designed to prepare students for personal participation as well as to suggest instruction in the applicable arts and sciences, this section emphasizes independent work in the community. Without minimizing classroom activities, it is hoped that young adults will volunteer their services to agencies of their own choice, if only because they acquire ...

Understanding Human Responsibilities and Opportunities

1. Identification of major conservation problems — awareness of how we use natural resources — is the first step.
2. Solutions can be reached through accepting stewardship of natural resources during our life and for the future.
3. Extending our stewardship to a concern and a trusteeship for all forms of life is the ultimate step.
4. High school is not too soon to start training for stewardship, nor to practice it. Students can serve and learn at the same time.

WATER

1. Management of water resources is a governmental function. It is carried out nationally by federal agencies under Acts of Congress.
2. The state has similar responsibilities, laws, and agencies.
3. Conservation requires difficult decisions. For example, if Denver cut its water use in half, and held its savings in reserve, people downstream who depend on the city's recycled water would be parched.

4. The conservation lesson can be learned at first hand from the local water situation.

AIR

1. We might be tempted to paraphrase Charles Warner's remark about the weather and say, "Everybody talks about air pollution but nobody does anything about it." We would be wrong. Experts disagree about how much is being done and how effectively, but it's there.
2. Some regulations apply in your community, and private individuals and companies are working toward strengthening or weakening the rules.

SOIL

1. Practices that conserve and even improve soil are widely known but not always observed.
2. Deciding whether to use land for farming, forest or wilderness, urbanization, extraction, or recreation is the people's responsibility.
3. Historically, land use has been unplanned, but there are exceptions: L'Enfant's for the City of Washington, the rebuilding of some bombed-out cities after World War II, green belt, and zoning efforts.
4. A study of local land use and regulations governing it will illustrate the problems.

ENERGY

1. People can use nature's efficient energy systems in order to reduce energy consumption.
2. Value decisions and the cost/benefit economics of energy consumption govern the efficiency of our energy use and our search for alternative renewable sources.
3. Energy conversion processes are of unequal efficiency, but efficiency is not always our chief consideration. We usually practice conservation only when the alternative is unpleasant.
4. Local energy resources and problems illustrate these issues, especially if students engage in conservation activities at home, school, and as volunteers in the community.

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LIFE

1. The degree to which we practice conservation can determine the fate of the human species. Survival requires the adaptabiiity that wise use of natural resources entails.
2. People's intervention in the environment imposes on us an obligation to maintain, restore, and enhance it, applying the principle that in nature diversity generates stability and strength.
3. A special role for high school students can be tutorial, helping to teach conservation principles to children in lower grades.
4. A survey of the needs of agriculture, grasslands, forests, plant life, and wildlife nearby or throughout Colorado will illustrate how our ability to comprehend can be coupled with our obligations.

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